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A MIOCENE TORTOISE FROM PATAGONIA¹

BY GEORGE GAYLORD SIMPSON

Some years ago the Scarritt Patagonian Expedition, under my direction, picked up a fossil tortoise shell in the Chubut Valley, central Patagonia. Such specimens are seldom of broad scientific interest, and preparation was postponed in favor of more probably fruitful work. On being prepared, however, this specimen did prove to be of unusual significance. The fact that it is a new species has no particular

interest in a group already containing so many species, but, more important, it represents a terrestrial Holarctic genus appearing in South America before the late Tertiary land-bridge existed. It also casts light on the interesting question of the origin of the recent South American tortoises and on the widely discussed Galápagos tortoises.

TAXONOMY

Testudo gringorum, new species

TYPE.—Amer. Mus. No. 3366 (Fossil Reptile Catalogue), plastron and much of carapace. Collected by Justino Hernández, Nov. 21, 1933.

HYPODIGM.—Type only.

HORIZON AND LOCALITY.—High in the predominantly marine Patagonian section overlying the fissile or laminated beds of Angosturas, south side of the Chubut Valley, between Gaiman and Dolavon, Chubut Territory, Argentina.

DIAGNOSIS.—As far as preserved, a characteristic *Testudo*, *sensu stricto*. Type relatively small for this genus (possibly young). Uncrushed carapace probably not very high. Sculpture slight, no prominent bosses or marginal projections. Sulci shallow. Anterior

border of carapace somewhat flattened but only slightly turned upward. Nuchal absent. Testudine alternating-wedge arrangement of costal plates moderately developed. Marginals longer in vertical-transverse than in anteroposterior dimensions. Gulars separate, elongate, extending onto entoplastron posteriorly. Epi-plastral lip more than twice as wide as long, strongly projecting and bifid anteriorly, emarginate at gular-humeral sulcus, border evenly convex posterior to this. Humeral-pectoral sulcus almost straight and transverse medially, turning abruptly anteroexternally in lateral part, crossing mid-line at posterior edge of entoplastron. Width of medial part of pectoral scutes about one-fifth that of abdominals. Posterior notch of plastron well developed, about four times as wide as deep.

AGE

Unfortunately the horizon of the specimen cannot be precisely defined in stratigraphic terms, but the relative age can be determined with some probability and within moderate limits. The Chubut Valley section about five kilometers west of this locality has been studied in detail (Frenguelli, 1927; Simpson, 1935), but the beds cannot be traced continuously, and they are markedly different in the two localities. No agreement has been reached

as to the correct identification of the lower beds of the Angosturas section, a thick series of thin-bedded sands, clays and tuffs. Above these, however, are predominantly marine beds referable to the Patagonian with little doubt. The fossil was found near the top of these beds. The exact limit between true or typical Patagonian and the overlying Super-Patagonian, Upper Patagonian or Aonikense of Frenguelli is not absolutely identified here, and the tortoise may have been either in the

¹ Publications of the Scarritt Expeditions, No. 32.

highest typical Patagonian or the lowest "Aonikense," probably the former. In any case, these two marine formations are of so nearly the same age that their separability is sometimes questioned. The horizon may be early or middle Miocene in age, more likely the former (depending also, of course, on the disputed correlation of the Patagonian). It is most unlikely but is barely possible that the horizon is really part of the later Tertiary sands that also occur in this region, in which case the age could be Mesopotamian or Huayquerian, latest Miocene or earliest Pliocene.

Marine fossils occurred a few meters both below and above the tortoise, but were not seen in the same bed, which was a fairly massive yellow-gray sandstone. The predominantly marine series was here evidently deposited near shore and has recurrent definitely shore-line facies, perhaps also some truly fluviatile intercalations. The tortoise must be interpreted as a terrestrial fossil, but its occurrence even in a purely marine bed (nearshore) would not necessarily be anomalous.

DESCRIPTION

Part of the carapace had decayed before burial, leaving a hole in the posteromedial and right posterolateral parts. Thus weakened, the carapace was considerably crushed by compacting of the sediments. Nevertheless the costal region of the left side can be almost completely made out and the marginal region from the small nuchal notch as far back as the sixth peripheral. The region of the midline is pre-

served only from the third neural forward and is not entirely clear even where present. The plastron is sufficiently preserved to reveal all its characters. The morphology is adequately given in the diagnosis and illustrations.

The length of the plastron is 207 mm. The median width of the shell was probably about 18–19 cm., and the length of the carapace 23–24 cm.

AFFINITIES

The known parts do not appear to have any characters not found in species currently referred to *Testudo* in a strict sense. It is, of course, possible that more complete material, including the skull, would warrant some other generic assignment, but this is unlikely since the structures known in this specimen are, as a rule, diagnostic. In any case the relationship to *Testudo* must be close.

Wieland (1923) described but did not illustrate a fragmentary specimen from an unknown horizon and locality supposedly in Patagonia. The specimen has not been available for comparison with *T. gringorum*. Wieland compared it with *Testudo* and allied genera and suggested that its characters tended to indicate pertinence to that genus, but he referred it questionably to the very different genus *Chelys*, calling it *Chelys* (?) *patagonica*.¹ If that specimen

is a *Chelys*, it is quite unrelated to the present species. If it is a *Testudo*, it is distinct from *T. gringorum* specifically because it is said to have heavy costal bosses, absent in the new species. Virtually no other possibly specific characters were mentioned by Wieland.

Rovereto (1914) described two relatively good Tertiary *Testudo* from Argentina. *T. gallardoi* is from the typical Araucanian of Catamarca and therefore almost surely later than our specimen. Vertebral and costal scutes had large bosses, as in Wieland's specimen (which he did not compare with Rovereto's prior description) but not in ours. The species are surely distinct, but little basis for ampler comparison with *T. gringorum* is available. *T. praestans* Rovereto from Monte Hermoso is

given and the name was said to be "purely arbitrary." I judge that the definition of a new species was not really intended and that this name has no legal status in formal nomenclature.

¹ Since no supposedly distinctive characters were

certainly much later than our species, but it considerably resembles the latter, and the two may well be related—could be ancestor and descendant. They are nevertheless distinct in numerous minor points, e.g., the less produced and less bifid epiplastral lip of *T. praestans* and its notably more posterior and curved hypoplastron-xiphoplastron suture.

In both the latter characters and many others our fossil resembles the living *T. argentina* and *T. tabulata*, to which it seems to have special relationship within the genus, and to either or both of which it could well be ancestral. There is, however, no question that the fossil merits specific distinction. From *T. argentina* it differs in the less wedge-shaped and less medially narrowed pectorals, more elongate marginals, less recurved anterior carapace margin, etc. *T. gringorum* was probably less narrow and deep than *T. tabulata*, although crushing obscures this character, and there are numerous slight differences such as the deeper gular notch of the fossil, less wedge-shaped pectorals, shorter (anteroposteriorly) femorals and

longer and narrower (transversely) anals. Fossil and living species are evidently nearly allied but not identical.

The various Galápagos tortoises, supposed by Garman (1917) to be derived from an ancestor related to *T. tabulata*, may represent more highly evolved derivatives of the same Neotropical stock. They are basically like *T. tabulata* and may be more immediately allied to the latter than to our extinct species, which could nevertheless be in or near the ancestry of all.

Most of the characters of *T. gringorum* can be found singly among the many Tertiary North American species of *Testudo* but not in this combination. As far as I have observed, the nuchal is always present in the North American species but absent in South American and Galápagos species, recent and fossil. *T. gringorum* could theoretically be derived from some of the earlier North American forms, but I see no clear evidence of special affinity with one species rather than another. *Hadrianus* and *Stylenys* are not so close.

GEOGRAPHIC IMPLICATIONS

Testudinids are somewhat doubtful in the late Cretaceous, surely known from the Eocene. The genus *Testudo* itself is not known to have existed until about the end of the Eocene. It was widespread in Holarctica in Oligocene and later times, became virtually world-wide and survived in the Recent in disjunctive insular and some continental species, mainly southern.

If *Testudo* reached South America by an early land-bridge, this must have been Paleocene at latest, but the genus may not have been in existence at that time. The most reasonable hypothesis involving such an early bridge must, then, be that the South American Tertiary *Testudo* developed independent of Holarctic *Testudo* by parallelism from a common ancestor. This hypothesis is so contrary to probability and so lacking in evidence that it cannot now be seriously supported.

On the relatively abundant mammalian evidence (see Simpson, 1940), I believe

that a discontinuous, stepping-stone migration route to and from Holarctica arose in or just before Mesopotamian time (probably latest Miocene) and a continuous bridge little or not at all before Chapadmalalan (latest Pliocene). Our Patagonian *Testudo* is surely much older than Chapadmalalan and probably older than Mesopotamian.

Although terrestrial, *Testudo* has almost certainly crossed considerable widths of salt water, probably accidentally carried by currents. It floats readily and can survive long periods of involuntary immersion in the sea. Once within sight of land, it can and does purposefully swim to it if tide and currents permit.

The most probable explanation of the mid-Tertiary appearance of *Testudo* in South America is that it reached there without a land-bridge, by a partly marine route. North America is the most likely source, although Africa is possible. In

either case, but especially if North America was the source, the (doubtless involuntary) migration would be facilitated by islands, such as those that preceded a Central

American isthmus and that later, becoming more numerous or closer together, facilitated the first invasion of procyonids.

BEARING ON THE GALÁPAGOS PROBLEM

The occurrence of well-differentiated land tortoises on the Galápagos Islands has given rise to extensive argument and discussion which will not be reviewed in this brief paper. The present fossil does not rigidly prove anything in this respect, but it does provide some interesting new data and suggestions. It adds to the evidence that the distribution of *Testudo* is not dependent on and not in the main a result of land connections. It demonstrates the presence of a possible ancestral stock for the Galápagos tortoises on the South

American mainland in Miocene, and probably early Miocene, times. It thus removes the necessity for postulating any other geographic derivation of the Galápagos tortoises. It also enormously increases the evident time available for those forms to have made an accidental crossing from the mainland and greatly increases the chances of such an event, which is improbable in a short time but is probable if the time is sufficiently long. It also increases the possible period available for the specific differentiation of the insular forms.

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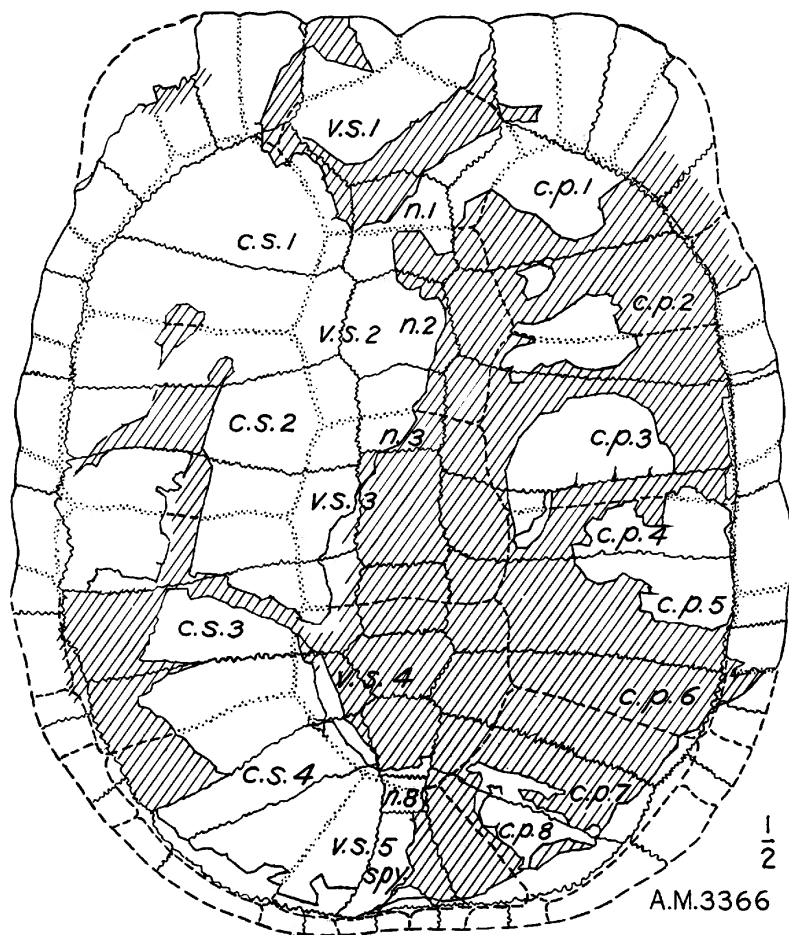


Fig. 1. *Testudo gringorum*, new species. Type, Amer. Mus. No. 3366 (Fossil Reptile Catalogue). Dorsal view of carapace, one-half natural size. Distortion has been corrected and missing parts restored (cross-hatched where determined by surrounding bone, blank with broken outline where hypothetical). Sulci between scutes dotted, bone sutures and margins solid lines. Drawn by John C. Germann.

Abbreviations (horny scute areas labeled on left side, bony plates on right side): c. p., costal plates, as numbered; c. s., costal scutes, as numbered; n., neural plates, as numbered; spy., suprapygial plate; v. s., vertebral scutes, as numbered.

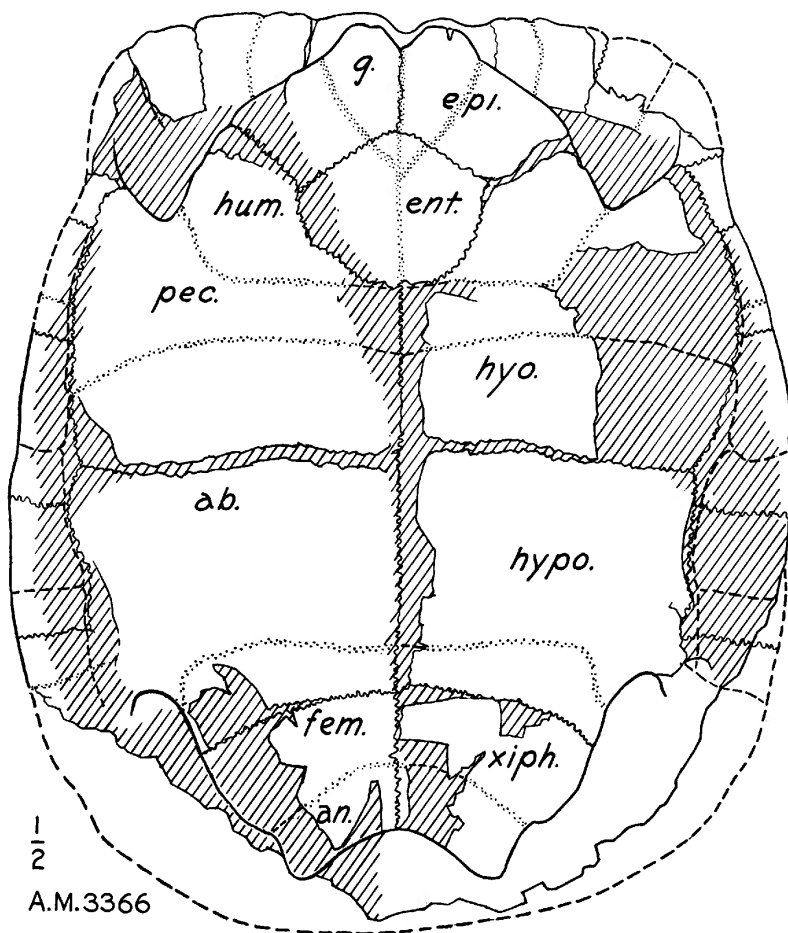


Fig. 2. *Testudo gringorum*, new species. Type, Amer. Mus. No. 3366 (Fossil Reptile Catalogue). Ventral view of plastron, one-half natural size. Technique of illustration as in Fig. 1. Drawn by John C. Germann.

Abbreviations: ab., abdominal scute; an., anal scute; ent., entoplastron (plate); epi., epiplastron (plate); fem., femoral scute; g., gular scute; hum., humeral scute; hyo., hyoplastron (plate); hypo., hypoplastron (plate); pec., pectoral scute; xiph., xiphiplastron (plate).

